uric acid without a corresponding increase in the urea or non-protein nitrogen fractions of the blood may be early evidence of an impairment of renal function. As in our cases there was no clinical evidence of nephritis, we are forced to look elsewhere for an explanation of this phenomenon.

**Summary.** Results are reported on four cases of myelogenous leukemia in which the chemical changes occurring in certain of the non-protein constituents of the blood during roentgen-ray treatment have been followed.

In the more severe cases the non-protein nitrogen was extremely high; after treatment a gradual but steady fall was noted. In view of the fact that the creatinin values are invariably normal and that in our most severe case urea accounted for only 20 per cent. of the non-protein nitrogen fraction (instead of the usual 50 per cent.), the suggestion is made that in leukemia there is present, possibly as a constituent of the white cells, some nitrogenous constituent not accounted for in the present scheme of micro-blood analysis.

The uric acid content of the blood was much increased, but a large diminution in the number of white cells which occurred as a result of treatment caused no appreciable decrease in this constituent.

# CHRONIC LUNG DISEASE FOLLOWING THE INFLUENZA PANDEMIC OF 1918-1919.[1]

By Morris J. Radin, M.D.,
NEW YORK.

(From the Internal Medicine, Female Outpatient Department, Mount Sinai Hospital, New York City.)

So protean a disease as influenza deserves and also enjoys a most complete literature. Its sequelæ, while not having been neglected by any means, have not been as fully treated as the disease itself, particularly those which require months and sometimes years to clear up. One of the reasons for this lies perhaps in the fact that previous epidemics have been caused by the Pfeiffer bacillus, while in 1918 this organism was rather more conspicuous by its absence than otherwise, with a resulting invasion of the body by an organism or group of organisms of more intense virulence. At any rate it is well remembered how devastating an infection the "flu" was in its incipiency and acute stage, and it is not surprising that complete recovery constitutes a slow process in some cases. The purposes of this paper are (1) to present the findings in 12 cases of post-

---

[4] Arch. Int. Med., 1916, xvii, 570.

[1] Read before the Yorkville Medical Society of New York City, February 16, 1920.

influenzal lung disease, (2) to record a few observations made upon them, and (3) to review some previously reported cases in the literature. It is to be regretted that the great number of patients to be questioned and examined in a dispensary clinic in the relatively short space of time allowed has made it impossible to study these cases as closely as was desirable. They must be shown, therefore, in mere outline:

Case I.—Mrs. R. G., aged twenty-seven years, Hungarian, No. 3502. Diagnosis: Chronic bronchitis and pleuritis.

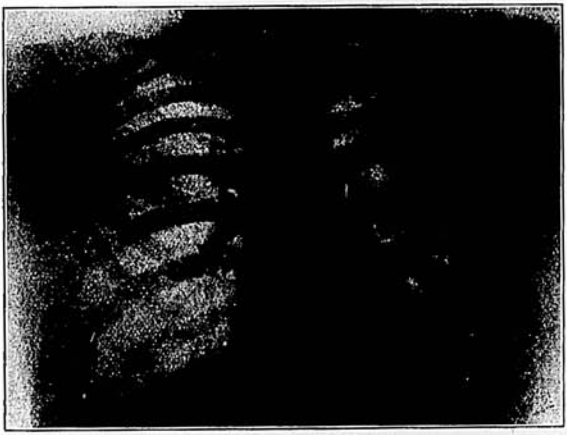

Fig. 1.—Case I. Roentgenogram showing shadow at left base, continuous with diaphragm—a thickening of the pleura.

This patient came to the clinic October 10, 1918. Her complaints at that time were cough, with marked expectoration, no blood, severe pain in the chest and back, slight epistaxis, headache, anorexia and weakness in the lower extremities. These were of two weeks' duration since recovery from an attack of influenza. Examination on admission showed a well-nourished woman. Head negative. Heart normal. Lungs showed poor expansion, prolonged expiration, no dulness but scattered dry rales. The diagnosis of chronic bronchitis was made and an expectorant mixture given. Temperature, 98.6° F.; pulse, 88.

May 17, 1919, seven months later, the patient returns complaining of the same symptoms. Heroin given.

June 7 and November 15 the patient's condition is unaltered.

November 22 still has signs of bronchitis.

December 18, patient returns, complaining of severe pain in the chest and back. Cough is now very marked. Brings up thick, yellow mucus. Examination at this time shows dulness at the left apex and slight dulness from the apex to the base on both sides posteriorly, particularly marked on the left side. There are a few crepitant rales at the left apex anteriorly, while posteriorly many moist mucous rales are heard from apex to base, a few pleural rubs being also made out at the extreme left base. Temperature, 99.2° F.; pulse, 80; respirations, 24. Sputum examination for the tubercle bacillus is negative. The roentgen report read as follows: "Roentgen-ray examination of the chest shows a fairly dense shadow at the extreme left base, which is continuous with that of the diaphragm. The roentgen appearance suggests a thickening of the pleura."

Case II.—Mrs. F. R., aged thirty-eight years, Russian, No. 5690. Diagnosis: pleuritis.

This woman came to the clinic January 25, 1919. Recovered from influenza six weeks ago. Since then she is unable to sleep because of a persistent cough, with pain in the back. No other complaints. Examination revealed a pale, emaciated woman. Teeth poor. Pharynx negative. Heart normal. Lungs showed dulness in small, scattered areas, with signs of a diffuse bronchitis. A few rubs were heard at the left base posteriorly. Heroin and creosote were prescribed.

February 25, patient is not improved.

March 12, complains of severe pain in the left back. The entire left side shows dulness, diminished respiration and diminished voice and whisper.

August 16, still coughing and has much pain in the left back.

December 9, same. Dry cough, no expectoration. There is slight dulness in the left axilla, with increased intensity of the inspiratory murmur. No rales.

December 11, slight expectoration. Pain is much diminished. Signs have almost disappeared. Sputum is negative for the tubercle bacillus.

December 24, "roentgen-ray examination of the chest shows no abnormality in the lungs." This was no doubt a case of post-influenzal pleuritis, which took a whole year to clear up.

Case III.—Mrs. S. B., aged twenty-nine years, Austrian, No. 5773. Diagnosis: Pleuritis, unresolved pneumonia?

This patient came to the clinic March 29, 1919, complaining for three months of severe pain in the chest on breathing. The pain began directly after recovery from an attack of influenza in January. Patient does not know if it was followed by pneumonia or not. Now has painful cough; no expectoration; no fever. No other symptoms except occasional heartburn. Examination showed a well-nourished woman. Pharynx red. Heart normal. At the right base posteriorly there is dulness, increased intensity of the inspiratory and expiratory murmur; no rales but a few rubs. Heroin and terpin hydrate given.

June 26, pain in the chest and back is not relieved.

July 19, restless all last night because of the pain in the chest. Bromides given.

August 17, still has pain. Examination at this time shows again dulness at the right base posteriorly, with increased intensity of the inspiratory and expiratory murmurs and a few rubs.

August 9, the roentgen report read as follows: "Roentgen-ray examination of the chest shows lessened aëration of the right lung, with marked density at the right base, which may be evidence of a thickened pleura or traces of an unresolved pneumonia." No sputum obtainable in this case. Temperature normal.

CASE IV.—Mrs. R. D., aged thirty-six years, Russian, No. 5822. Diagnosis: Chronic bronchitis.

This patient came to the clinic May 10, 1919. Had influenza four months ago. Since then she has been coughing and expectorating thick, yellow mucus. Pain in the chest and back is marked. "Gets a cold" very easily, making it necessary for her to be in bed for three or four days at a time. Thinks she has slight fever now. Feels very weak. Examination showed a young woman, well-nourished, coughing. Many teeth missing. Pharynx normal. Heart normal, but very rapid action. Lungs showed dulness at the right apex anteriorly and at both bases posteriorly, with coarse, moist rales at the end of inspiration. Temperature, 99° F.; pulse, 92. Urine negative. Sputum examination for the tubercle bacillus negative. Expectorant mixture given.

December 16, returns complaining of slight pain in the chest and slight cough. There is slightly increased intensity to the breath sounds at the left base posteriorly, but no dulness or rales. Patient is practically well.

CASE V.—Mrs. M. Z., aged twenty-eight years, Russian, No. 5831. Diagnosis: Chronic bronchitis.

This patient first appeared in the clinic on May 17, 1919, She did not return for further study. Her complaint was that since an attack of influenza, with pneumonia, the winter before she had not been at all well. There was headache, dyspnea on exertion, marked pain in the chest, cough but with scant expectoration. A few days previous to her visit to the clinic these symptoms had suddenly become worse. Examination showed a young woman not acutely ill apparently. Head normal. Pharynx normal. Pyorrhea alveolaris. Faint apical, non-transmitted, purring systolic murmur, but the heart was otherwise normal. Lungs showed slight dulness at both apices, with roughened inspiration and an occasional mucous rale. Expectorant mixture given. Urine negative. Temperature, 99.4° F.; pulse, 88; respirations, 24. No sputum obtainable.

CASE VI.—Mrs. S. G., aged forty-one years, American, No. 5832. Diagnosis: Pleuritis, unresolved pneumonia.

This patient came to the clinic May 20, 1919. Had influenza, followed by pneumonia, one year ago. Was in Mount Sinai Hospital for nine months. Pain in the chest, which followed, has not yet disappeared. Cough marked. Brought up blood last night. Flushes easily. Headache. No vomiting. Bowels costive. Examination showed a well-nourished woman. Face flushed. Pharynx negative. Teeth false. Small simple goiter. Heart normal except for a faint, non-transmitted apical systolic murmur. Labile pulse. Lungs: Left base showed dulness, roughened inspiration but no rales. Right base showed dulness, decreased respiration by measure and sound and increased vocal fremitus. Bronchophony at the spine opposite the middle of the scapula. Tender liver edge was palpable. Left lumbar scoliosis. Reflexes exaggerated. Temperature, 99° F.; pulse, 80; respirations, 24. Creosote and heroin given.

May 20, "Roentgen-ray examination of the chest does not show any definite abnormality in the lungs. It should be stated, however, that owing to the marked scoliosis of the lumbar spine, with a resulting deformity of the chest, it is very hard to interpret the plates." Sputum negative for the tubercle bacillus. Urine negative.

December 2, still coughs and has pain in the chest. Examination at this time shows dulness at the left base but no rales. The bronchophony has disappeared.

December 9, a second roentgen ray "does not show any definite abnormality in the lungs."

December 16, still has slight cough and pain in the chest. On examination there is nothing abnormal except a slight dulness at the left base.

CASE VII.—Mrs. M. R., aged twenty-three, Russian, No. 5841. Diagnosis: Chronic bronchitis.

This patient appeared in the clinic May 27, 1919. Since recovery from influenza last February has been having slight cough, without expectoration, marked pain in the chest, poor appetite and weakness. Examination showed a well-preserved young woman. No abnormality except high-pitched voice and breath sounds at the left base posteriorly. Heroin given.

June 3, same.

June 6, same.

September 9, complains of severe pain in the left chest. Strapped.

September 18, still has pain in the chest. Examination shows roughened inspiration, with an occasional mucous rale at both bases.

October 28, "roentgen-ray examination of the chest does not show any definite abnormality in the lungs." No sputum obtainable.

Case VIII.—Mrs. K. S., aged forty-six years, Russian, No. 5880. Diagnosis: Pleuritis, unresolved pneumonia.

This patient came to the clinic June 26, 1919. Influenza five months ago. Still has pain in the left chest. Headache. Coughed up blood yesterday. Cough is not frequent, however. No other complaints. Examination is negative except for the presence of dulness and fine, moist, crackling rales at the left base posteriorly at the end of inspiration. Heroin and creosote given. Sputum is negative for the tubercle bacillus.

July 15, feels somewhat better.

July 18, had an hemoptysis yesterday. Feels dizzy.

August 14, "Roentgen-ray examination of the chest shows neither of the bases to appear clear, but there does not seem to be any definite sign of effusion. The right diaphragm shows two adhesions."

September 9, pain same but cough is lessened.

November 16, same. Has not returned to the clinic since.

Case IX.—Mrs. T. S., aged twenty-six years, Russian, No. 5933. Diagnosis: Pleuritis, asthma.

This patient came to the clinic August 9, 1919. Had a severe attack of influenza last February. Since then feels weak and dizzy. Marked palpitation on exertion. Pain in the chest, boring through to the back. Cough but no expectoration. Poor appetite. Examination reveals a poorly nourished woman. The rest of the examination is negative except for the lungs, which show dulness with roughened inspiration at both bases posteriorly but no rales. Creosote given.

September 19, very weak. Maltine with hypophosphites.

September 23, strychnin sulphate.

November 1, "Roentgen-ray examination of the chest shows a shadow at the extreme left base just above the diaphragm. This is probably due to a thickening of the pleura." Heroin.

November 6, same pain, great difficulty in expiration yesterday. Examination shows prolonged expiration and many musical rales all over the chest and back. A mixture containing belladonna, spirits of ether and potassium iodide was given.

December 13, patient feels better. Second roentgen ray shows at this time "no abnormality in the lungs."

December 16, dulness and roughened inspiration at the left base still present, but the musical rales and prolonged expiration have disappeared. Sputum negative for the tubercle bacillus.

Case X.—Mrs. C. G., aged thirty years, Russian, No. 5968. Diagnosis: Pulmonary tuberculosis.

This patient came to the clinic September 6, 1919, complaining of cough for one year. It began two months after recovery from influenza. Still coughs. Blood-streaked sputum three weeks ago. Pain in the chest is sometimes localized to the left apex. Headache, weakness and anorexia. No night-sweats, fever, or loss in weight.

Examination showed a slight goiter. The lungs showed dulness and many moist rales at the left base. There were fine crepitations and increased voice and whisper at the apices anteriorly.

September 9, blood-streaked sputum for the past two days. Creosote given.

September 11, roentgen-ray examination of the chest shows small tuberculous cavities at the apices. Sputum shows the tubercle bacillus. The patient was referred to the tuberculosis clinic for treatment.

CASE XI.—Mrs. D. W., aged sixty-three years, Roumanian, No. 5987. Diagnosis: Tuberculous mediastinitis.

This patient came to the clinic September 18, 1919. Had grippe six months ago and also one month ago. Complains of pain in the chest for the past two weeks and marked cough for six months. Cough worse of late. No expectoration. Headache. No loss in weight. Her menopause occurred at the age of forty-eight. Examination showed an old woman. Teeth false. Bulge of chest to the left. Dulness to flatness on both sides of midsternal line. Suprasternal veins enlarged. Heart enlarged to the left by percussion. No apex-beat visible or palpable. No murmurs. A2 exaggerated. Lungs showed dulness at the right apex anteriorly and at the left base posteriorly, with bronchovesicular respiration in the left axilla and base. No sputum obtainable. The urine was normal.

September 18, "roentgen-ray examination of the chest shows a considerable number of infiltrations in both upper lobes, extending down to the level of the second rib on the right and the third rib on the left. The roentgen appearance is that of a tuberculous process. There appears to be also some mediastinal involvement."

CASE XII.—Mrs. K. G., aged forty-one years, Russian, No. 6236. Diagnosis: Pulmonary tuberculosis; enlarged aorta.

This patient came to the clinic December 16, 1919, complaining of pain in the chest for the past few months. This began shortly after an attack of the "flu" in March, 1919. Spits up blood. Short of breath. Feels sore beneath the sternum. Pain in the sides. Coughs considerably. Has headaches. Bowels costive. No urinary disturbances. Examination showed a fairly well-nourished and developed woman whose expression is worried. Pharynx reddened. Tonsils not enlarged. Teeth poor. Thyroid negative. Pulsation in the neck and over the upper sternum, with marked dulness in this region. Impure second aortic sound. Heart is not enlarged, however. Lungs show dulness at the apices anteriorly and also down to the angles of the scapulæ posteriorly. At the left apex there is increased intensity to the voice and whisper, while at the right a few fine, crackling rales with bronchovesicular respiration, may be heard.

December 16, "roentgen-ray examination of the chest shows an extensive bilateral tuberculosis extending to the level of the fourth rib anteriorly. There appears to be, in addition, a hypertrophy of the left ventricle. The aorta is moderately enlarged."

December 23, hemoptysis is not so marked this week. Same signs. Sputum could not be obtained.

SUMMARY OF CASES.

| Case. | Date of influenza. | Diagnosis. | Nutrition. | Fever. | Sputum. | Roentgen-ray findings. | Result, Jan. 1, 1920. |
|---|---|---|---|---|---|---|---|
| 1 | Oct., 1918 | Pleuritis; chronic bronchitis | Good | None | Thick; no tubercles | Shadow at left base; a thick pleura | Same. |
| 2 | Jan., 1919 | Pleuritis | Poor | " | No tubercles | Not taken | Much improved. |
| 3 | Jan., 1919 | Pleuritis; unresolved pneumonia? | Good | " | None | Shadow at right base | Same. |
| 4 | Feb., 1919 | Chronic bronchitis | " | " | Thick; no tubercles | Not taken | Well. |
| 5 | "Last winter" | Chronic bronchitis | " | " | None | Not taken | Well. |
| 6 | May, 1918 | Pleuritis; unresolved pneumonia? | " | " | Bloody; no tubercles | Negative | Much improved. |
| 7 | Feb., 1919 | Chronic bronchitis | " | " | None | Negative | Much improved. |
| 8 | Feb., 1919 | Pleuritis; unresolved pneumonia? | " | " | Bloody; no tubercles | Bases cloudy; adhesions to diaphragm | Much improved. |
| 9 | Feb., 1919 | Pleuritis | Poor | " | Slight; no tubercles | Thickened left pleura | Asthma. |
| 10 | July, 1918 | Pulmonary tuberculosis | " | " | Bloody; tubercles positive | Small cavities in both apices | Poor health. |
| 11 | May, 1919 | Tuberculosis; mediastinitis | " | " | None | Infiltrations in both apices | Poor health. |
| 12 | Mar., 1919 | Tuberculosis; enlarged aorta. | Good | " | Bloody; no tubercles | Infiltrations in both apices; enlarged aorta; left ventricle hypertrophy | Poor health. |

In all cases, except Case 10, the symptoms for which the patients sought relief began directly after the attack of influenza; in Case 10 they began two months after.

There were several other cases (about seven) whose cough, pain in the chest and back, dyspnea and palpitation on exertion and history of a preëxisting influenza attack made it almost morally certain that they, too, belonged in this group, but they were excluded because of insufficient clinical evidence to warrant the diagnosis of chronic lung disease. An analysis of the foregoing chart reveals the following interesting facts:

1. The duration of the lung disease was in 3 cases over one year, in 2 cases eleven months, in 5 cases ten months and in the remaining 2 cases about eight months.

2. The lesion present was in 6 cases pleuritis—3 of which probably also had unresolved pneumonia; in 3 cases chronic diffuse bronchitis and in the remaining 3 cases pulmonary tuberculosis.

3. In all but 3 cases the pathological process was at the bases of the lungs. These 3 were tuberculous cases.

4. Sputum was absent in the pleuritis cases as a general rule and

copious in the bronchitis cases. Hemoptysis occurred 4 times, but the tubercle bacillus could be found in only 1 case.

5. The pain occupied wide areas. Often the patient swept her hand from apex to base in describing it. Localized pain occurred only once (Case X). This patient was tuberculous.

6. Fever was absent altogether.

7. The nutrition was poor in but 4 cases; 2 of them were tuberculous. Despite the asthenia, of which the patients complained so much, they were able to keep up their general nutrition.

8. A lapse of an average of ten months, after the original influenza, has left 2 patients well, 2 unchanged, 3 tuberculous and in poor health; 1 slightly asthmatic, but otherwise much improved and the remaining 4 much improved. The only ones in which improvement was lacking were the tuberculous cases. In the others it was the rule, but very slow in coming about.

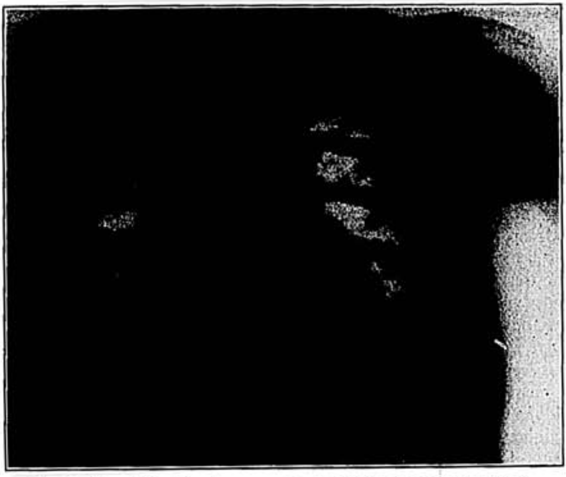

FIG. 2.—Case XII. Roentgenogram showing bilateral, apical tuberculosis, hypertrophy of the left ventricle and enlargement of the aortic arch.

9. Creosote and heroin gave the best results in the treatment.

The pathology of this series was comparatively simple—pleurisy with possibly unresolved pneumonia, chronic bronchitis and pulmonary tuberculosis. The latter lesion was at the apices and the former ones at the bases. During the epidemic proper it was not so simple, however. Huge multiple abscesses, interlobar collections of pus, copious empyemata, wide areas of consolidation in odd parts of the lungs, thick pleurisies and mushy gangrene of the lungs were not infrequent. Chronic effects from such lesions were to be expected in some cases which recovered.

Neuhof and Davidson[2] have found by systematic fluoroscopic examinations of many patients with pneumonia during convalescence that there were distinct shadows present over the localized areas of preëxisting consolidation for some weeks after the crisis. This was interpreted by them to mean that complete resolution in pneumonia did not take place for weeks and the physical signs of localized bronchitis might mean incomplete resolution even when the signs of consolidation had disappeared.

Feissinger,[3] in 1889, saw 126 cases of influenza in children and described 2 cases of chronic pulmonary congestion. One was that of a boy, aged seven years, who on the twelfth day of the disease had a fall in temperature, but a subsequent rise each evening. There was dulness, markedly diminished respiration and rubs at the right base posteriorly. Occasionally subcrepitant rales were heard over this area, but they were most frequently absent. Complete resolution took place fifty-two days after the onset of the disease. The second was that of a girl, aged five years, who had practically the same signs, which did not clear up until the sixty-first day. Eshner,[4] in 1894, cites a case of endocarditis and pleuritis following influenza in a male, aged twenty-five years, which took two years to recover from. The entire left side was involved. Morel-Lavallée,[5] in 1897, describe several cases of dry pleurisy following influenza. There was in a few no discomfort, but in the majority cough and pain in the chest were severe. There was no fever. Epistaxis occurred in 3 cases and dyspnea such as is seen in toxic conditions. An average of five weeks was required to recover from the pleurisy. In 1902, Lord[6] reported the clinical findings in 18 cases of chronic influenza in whom bacteriological examination of the sputum revealed the Pfeiffer bacillus in every case. Repeated examinations of the sputum for the tubercle bacillus were negative. The material was from the male outpatient department of the Massachusetts General Hospital. According to Lord the pathology of these cases—no autopsies were obtainable—is probably small patches of original bronchopneumonia, which break down into small abscesses, the constant discharge from which induces a chronic bronchitis. Of the 18 the physical signs showed in 10 cases diffuse bronchitis, bilateral apical bronchitis in 1, nothing abnormal in 2, repeatedly recorded signs of consolidation at the left base in 1, and in the remaining 4 cases the diagnosis of bronchial asthma was made. He believes that these 4 were really suffering from paroxysmal dyspnea. No Curschmann spirals or Charcot-Leyden crystals were present in the sputum, and eosinophiles were absent from the blood. He thinks that emphysema and even bronchiectasis may be caused by so much coughing.

---

[2] Clinical Survey of Acute Pulmonary Affections of 1916, New York Med. Jour., June 2, 1917.

[3] De la Congestion Pulmonaire Chronique Consécutive à la grippe, Gaz. méd. de Paris, December 14, 1889, vi, 592–594.

[4] Influenza Followed by Pleuritis and Endocarditis, Med. News, Philadelphia, 1894, lxiv, 148.

[5] Pleurésie Sèche Bilatérale d'origine Grippale, Bull. et mém. Soc. des hôp. de Paris, 1897, 3 s., xiv, 1369–71.

[6] Eleven Acute and Eighteen Chronic Cases of Influenza Proved by Bacteriological Examination, Boston Med. and Surg. Jour., December 18, 1902, No. 25, clxvii, 659–669.

In 1909, Franke[7] studied a large series of cases in Berlin. Fever was absent. Blood counts made in 100 cases showed normal figures. Hemoglobin was from 75 per cent. to 80 per cent. Urine occasionally showed albumin, but in the majority it was normal. The usual asthenic symptoms were present. Neuralgic pains in the back, chest and limbs were persistent and due to neuritis. Franke warns against diagnosing pleurisy, endocarditis, renal colic, appendicitis or any other painful condition without first eliminating this neuritis. Two signs in chronic influenza worked by himself are (1) beefy redness and dryness of the soft palate, and (2) corrugation of the tongue with enlargement of the organ and hypertrophy of the anterior papillæ. Of lung signs, showers of rales in various parts of the lungs were most frequent. They occasionally disappeared with heroin or codein, only to return on discontinuance of its use. These cases he regarded as tuberculous, but the tubercle bacillus could not be found in the sputum.

The question of tuberculosis following influenza is a difficult one to be positive about. To attempt to establish a basis for the differential diagnosis between tuberculous and other forms of lung disease by means of the observations noted in the 12 cases in the series of this paper is obviously both unscientific and useless. A very definite statement in this connection is made by Fishberg,[8] under whose observation may hundreds of cases of the so-called "flu" have come, both during the epidemic of 1918 and much later. His position is best stated by the following quotation: "Contrary to the teachings of writers of previous generations the recent epidemic of influenza has shown that this disease is not etiologically related to tuberculosis. Of the hundreds of cases which have come under my observation during the past year in which cough, expectoration, fever etc., have persisted after an attack of influenza, only one turned out to be tuberculosis. The pulmonary sequelæ of influenza are hardly ever tuberculous in character. Most of these patients suffer from bronchitis, bronchiectasis, pleurisy, abscess of the lung, etc. They should not be banished to distant climes or sanatoriums."

---

[7] Ueber Chronische Influenza, Wien. u. Leipzig, Urban, 1909, pp. 203-232; in Beihefte z. med. Klinik, j, 9 h. 10.

[8] Diagnostic Pitfalls in Pulmonary Tuberculosis, New York Med. Record, January 17, 1920, No. 3, xcvii, 89-94.

It will be seen, then, that chronic lung disease following influenza is not so uncommon and that it is easy to say "tuberculosis," but it is a very hard thing to prove.

I wish to express my thanks to Dr. Jaches, to Dr. Wessler and to Dr. Lund, roentgenologists to the Mount Sinai Hospital, for their kindness and coöperation in the roentgen-ray department; and to Dr. Friedman and to Dr. Weiss, my colleagues in the clinic, for referring their cases to me.

---

# PNEUMONIA AT A BASE HOSPITAL, 1918–19.

By Henry J. John, M.D.,
CLEVELAND, OHIO,
LATE CAPTAIN, M.C.; ASSISTANT CHIEF, MEDICAL SERVICE, U. S. A. BASE HOSPITAL, FORT SAM HOUSTON, TEXAS.

This is an account of my personal observations of pneumonia at the Base Hospital, Fort Sam Houston, Texas, during the season 1918–19, of cases which were under my immediate control and treated and studied by me personally. A series of 137 cases were admitted to my ward without selection, picked up in the different influenza wards and diagnosed pneumonias; thus I think that they represent fairly well a picture of the type of pneumonia we had to deal with during the epidemic. Some of the cases were moribund when admitted, but most of them were diagnosed early, so that the study in the majority of cases began at the early stage of the pneumonic process. Much care was given to the working out of the bacteriology of each individual case as well as the clinical aspects of the disease. With the splendid coöperation of the laboratory and the adequate nursing facilities I was enabled to carry on this work to the end of the epidemic. I wish to express my hearty thanks to all those who took an enthusiastic part in this work. Miss King did the blood chemistry on cases studied.

In the study of the sputa and the throat swabs the request was always made out for the four types of organisms, viz.:

1. Pneumococcus type.
2. Streptococcus hemolyticus.
3. Influenza bacillus.
4. Micrococcus catarrhalis.

Thus the accompanying tables have "plus" for positive and "minus" for none present. Here, however, I must state that the special media for the cultivation of the Bacillus influenzæ as described by Avery, of the Rockefeller Institute for Medical Research in the *Jour. Am. Med. Assn.*, lxxi, 2050, was not used, which may answer for our very low percentage of the Bacillus influenzæ found.

BACTERIOLOGICAL VARIETIES PRESENT. The diagram shows the incidence of the various types of pneumococci isolated from the sputum. The sum total of these various types represents 43.8 per cent. It is difficult to say whether or not a pneumococcus found in sputum represents lobar pneumonia. There were some cases which were lacking a frank lobar consolidation in which we did isolate pneumococci from the sputum. Should these be classed as lobar pneumonias? This has always been a question in my mind, the exact status of what constitutes a lobar pneumonia, whether a frank consolidation with pneumococci found in sputum or even a partial consolidation or patchy consolidation with a pneumococcus recovered from the sputum or the blood stream.

Pneumonias here described followed influenza. Just what percentage of them I am unable to say. The diagnosis of influenza in some of these cases I have questioned; thus I hardly think it would be accurate to try to give the percentage of cases that followed influenza. Let us say that the majority had influenza preceding pneumonia.

The bronchopneumonias with the etiological factor of Streptococcus hemolyticus made up 36.7 per cent. Some of these cases later in the disease went into massive consolidation, described by McCallum and Cole last year, with pleural effusions and a very high mortality, which in these cases was 83.3 per cent. It is of interest to note that of the 30 cases from which Streptococcus hemolyticus was isolated from the sputum it was found in the blood stream 13 times and it was not found 17 times. Of the positive blood cultures here 92.3 per cent. died, whereas only 57.64 per cent. died with the negative blood cultures.

The influenza bacillus recovered from the sputum composed only 2.4 per cent. The low percentage of the influenza bacilli found may be due to several causes:

1. The cases were not early influenza, only coming into this group after pneumonia developed.
2. Cultures were made on ordinary blood agar, the special media described by Avery, of the Rockefeller Institute, not having at this time been in use.
3. No special effort was made by repeated examinations to find Bacillus influenzæ.

Micrococcus catarrhalis represents 17.1 per cent. There were no deaths in this series.

The clinical picture of both the lobar and the bronchopneumonias has been described too many times by the different observers, and I shall not add to the numerous repetitions, for our cases did not differ in this aspect from those at other places. I have already described these sufficiently in another paper.

The bacteriology of throat cultures represents one important